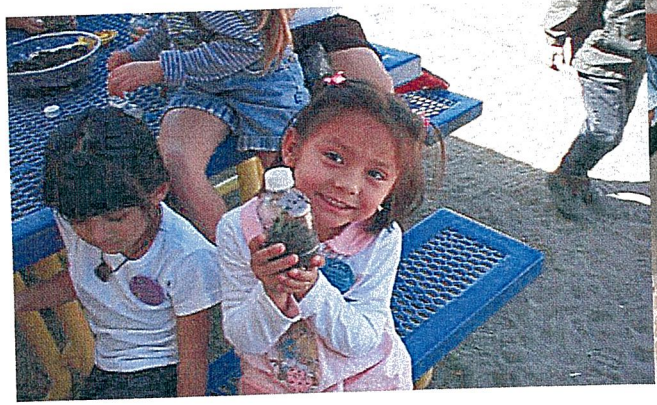
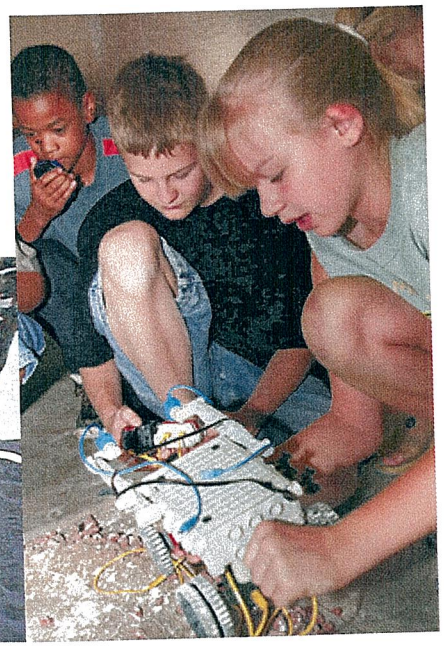
STEM EDUCATION in America

"To sustain the top spot in today's global, knowledge intensive competition, the U.S. must produce wave after wave of new graduates who can help the country create and replenish knowledge, especially technical knowledge."

Hispanic Business News May 19, 2005





Creating Sustainable Economic Growth

Building New Mexico's Technology Literate Workforce

- Current issues in STEM education are magnified in NM
- In 2003, National Assessment of Educational Progress ranked New Mexico 49th in math
- Achievement gap between Hispanic and Anglo is growing - from 18% in 2000 to 24% in 2003, in math and science.
- 80% of middle school math and science teachers are not adequately trained and not certified to teach these subjects.

In 2006, the National Science Foundation reported a growing need for —

- Stronger public support for student achievement in the STEM subjects
- High-quality teachers with extensive content knowledge in math and science
- Increased opportunities to learn for underrepresented students
- Effective guidance counseling on STEM education and careers
- Program assessment tools that reinforce learning in STEM fields

STEM Education in the Borderland

The Challenge

Transform New Mexico's educational system to produce a technologically literate workforce needed to create sustainable economic prosperity in a rapidly evolving global economy.

The Need for Statewide Collaboration

Statewide, approximately 100 independently managed and funded educational outreach and professional development programs target instruction and increased achievement in STEM. *Sixty of these programs are sponsored by NMSU.*

Collaboration among government, education and the private sector is key to bringing high-quality STEM education to all students.

The Solution

- Establish a statewide collaborative effort in STEM education:
  - Encourage communication and knowledge sharing among all STEM activities across the state.
  - Facilitate collaboration among educators, legislators, government agencies, and private enterprises in directing projects and securing funding.
  - ***Create a seamless pipeline for education Pre-K~20, aligning New Mexico's and the Nation's goals for educational success and economic development.***

Educational Outreach at NMSU

- Promoting professional development for science and math teachers
- Targeting K-12 STEM education focused on diverse student populations
- Enhancing public school STEM education through university summer and after-school "*bridge programs*" targeting underrepresented students
- Strengthening collaboration between partnerships and outreach programs
- Creating learning communities of teachers statewide
- Improving retention of under-prepared freshmen in STEM disciplines
- Expanding collaboration between NMSU's colleges and the NM public education system
- Supporting efforts being made in STEM at other institutions throughout the state

NMSU outreach programs are redefining STEM education delivery in K-12 classrooms through a seamless pipeline that aligns curriculum in math and science

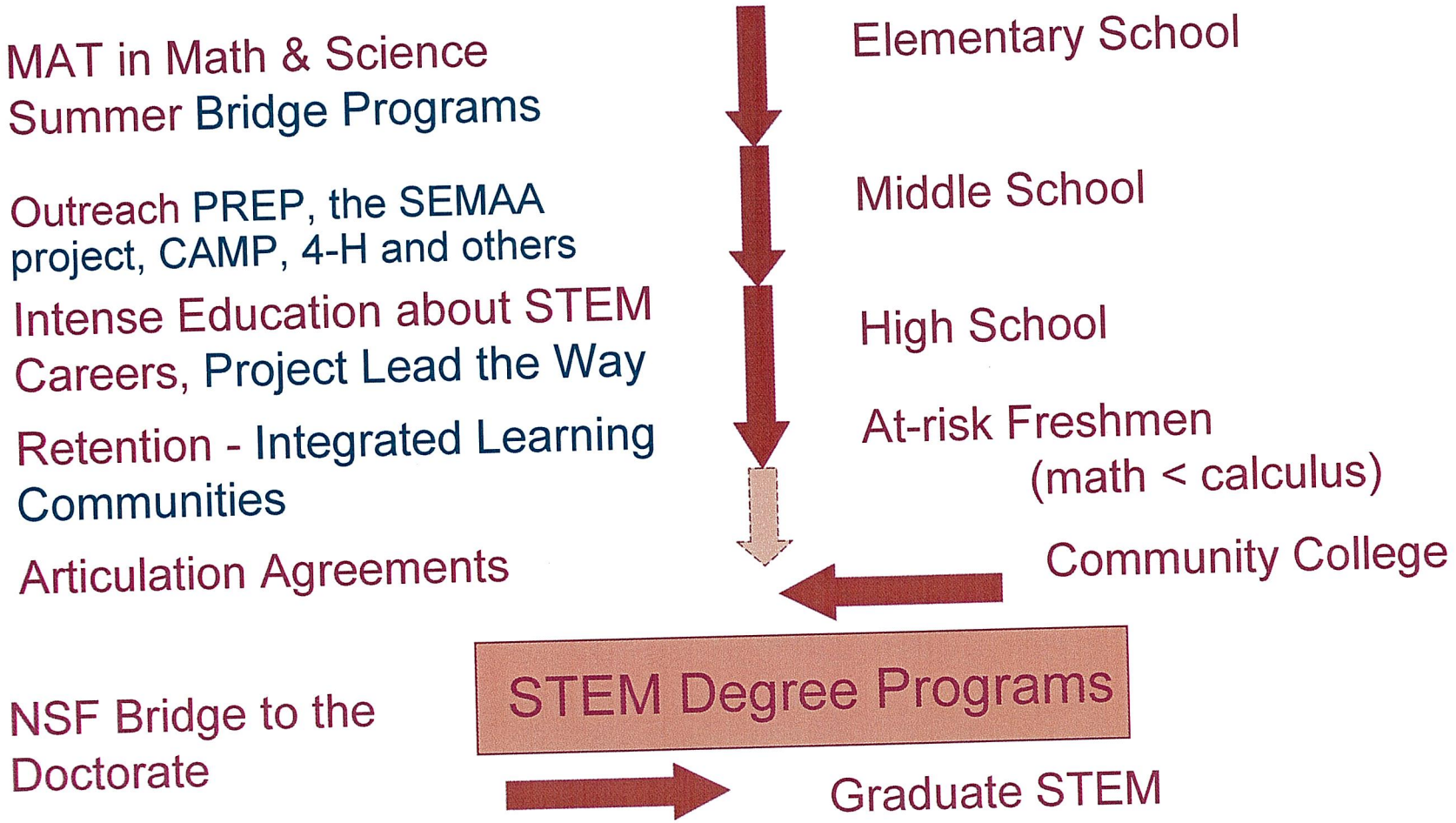
The Master of Arts in Teaching in Mathematics

- Serving the Gadsden and Las Cruces school districts and other areas
  (Faculty from Colleges of Education and Arts & Sciences)

The Master of Arts in Teaching in Science

- Serving teachers through distance education developed by Scientists working with Mathematicians.
  (Faculty from Colleges of Education and Arts & Sciences)

Integrated STEM Pipeline



NMSU actively sponsors 60 outreach and professional development programs that are improving instruction and learning in the STEM fields. A few of these outstanding programs include….

- ✓ SEMAA (Science Engineering Mathematics Aerospace Academy) provides enrichment of science and math curriculum
- ✓ ASSURED (Agricultural Science Summer Undergraduate Research and Education Development) program works with students to build careers in agriculture
- ✓ AGEP (Alliance for Graduate Education and the Professoriate) provides funding for doctoral students pursuing careers in the sciences
- ✓ AMP (Alliance for Minority Participation) increases underrepresented students entering engineering
- ✓ RASEM^2 (Regional Alliance for Science, Engineering and Mathematics) programs statewide increase student achievement in all subjects
- ✓ The MC^2 (Mathematically Connected Communities) project focuses on professional development for math teachers, principals and district leaders
- ✓ New Mexico Learning Network is expanding e-learning throughout the state
- ✓ MARC (Minority Access to Research Careers) increases opportunities for research in biomedical sciences
- ✓ RETA (Regional Educational Technology Assistance) provides technology support for learning to K-12 schools statewide
- ✓ WERC (Consortium for Environmental Education and Technology Development) promotes exploration-based inquiry in environmental sciences

Steps to Reform in Mathematics…

In 2007, the NSF provided funding to evaluate the replication of the highly effective Gadsden Model ..a local success story becomes a template for achievement in math for all New Mexico students.

THE GOAL

Students are highly motivated and able to achieve in mathematics. They learn to think, problem-solve and use mathematics in real-world situations.

7. Use a system of classroom assessments to help teachers analyze student learning and revise teaching.

6. Provide each school with an instructional coach to assist grade level teams with day-to-day implementation of the math program.

5. Implement a rigorous math curriculum district-wide aligned with state standards and assessments. Teach higher level reasoning.

4. Provide ongoing professional development for teams of teachers and principals ensuring time for engagement with mathematical learning.

3. Ensure total district commitment to aligning resources (e.g., textbooks, Title I and II funds, operational funds, scheduling) to create bottom-up and top-down change.

2. Work with knowledgeable partners to develop and articulate a systematic plan for change with focused goals that include every teacher and principal in the reform effort.

1. Obtain agreement by all stakeholders on the need for change based on student achievement data.

NMSU STEM education programs are producing positive results

- Gadsden Math Initiative has dramatically increased test scores in the Gadsden Public School District
- High percentage of PREP (Pre-Freshman Engineering Program) graduates enter STEM degree programs
- Dramatically increased retention through Integrated Learning Communities in engineering
- Substantial increase in freshman students in STEM disciplines

- AGEP assists 100 doctoral students in STEM each year
- Over 15 years, AMP has helped more than 6,000 underrepresented students move towards engineering degrees.
- RASEM^2 works with more than 3,000 students with disabilities since 2002.
- The Learning Network assists more than 3,000 students online each year.
- Project Lead The Way engages 800 students each year in pre-engineering career path orientation activities
- More than 4,000 students exposed to STEM through SEMAA each year

Taking STEM educational outreach and professional development to the next level

Attainable Goals

Conduct research on teaching, learning, leadership and policy impediments and models

Improve capacity of Pre-K~20 teachers/administrators providing quality STEM education

Build a sustainable system for workforce development by preparing K-12 students to move into higher education and the technical and scientific workplace.

Expand and coordinate Pre-K~20 STEM education programs statewide

Research Best Practices for instruction and learning in math and science

Provide quality professional development for teachers and administrators

Develop program evaluation and learning outcomes assessment models

Increase second year retention rates for at-risk students in STEM disciplines to 70% through the use of integrated learning communities

Increase graduates in STEM disciplines at NMSU by 30% over next 5 years!

In 2007, the U.S. Congress enacted the **American Competes Act**, also known as the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act, with a mandate

"To invest in innovation and education to improve the competitiveness of the United States in the global economy."

In this exciting time of heightened awareness and competition, NMSU continues to align its efforts in STEM with this national agenda and with our State's strategies for improving education and ensuring prosperity for all New Mexicans.